

Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Control of Flow Structure in Square Cross-Sectioned U Bend using Numerical Modeling¹ MEHMET METIN YAVUZ, YIGITCAN GUDEN, Middle East Technical University (METU) — Due to the curvature in U-bends, the flow development involves complex flow structures including Dean vortices and high levels of turbulence that are quite critical in considering noise problems and structural failure of the ducts. Computational fluid dynamic (CFD) models are developed using ANSYS Fluent to analyze and to control the flow structure in a square cross-sectioned U-bend with a radius of curvature $R_c/D=0.65$. The predictions of velocity profiles on different angular positions of the U-bend are compared against the experimental results available in the literature and the previous numerical studies. The performances of different turbulence models are evaluated to propose the best numerical approach that has high accuracy with reduced computation time. The numerical results of the present study indicate improvements with respect to the previous numerical predictions and very good agreement with the available experimental results. In addition, a flow control technique is utilized to regulate the flow inside the bend. The elimination of Dean vortices along with significant reduction in turbulence levels in different cross flow planes are successfully achieved when the flow control technique is applied.

¹The project is supported by Meteksan Defense Industries, Inc.

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Date submitted: 31 Jul 2014

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